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## REMARKS

### Summary of Claims Status

Claims 1-27 have been allowed. Claims 28-39, 42-57, 61-68 and 72-77 previously have been cancelled, without prejudice. Claims 32-115 have been rejected on various grounds. Applicants hereby cancel claims 99-108, also without prejudice, to avoid interfering claimed subject matter with the Brinker patent of record. Applicants hereby add claims 116-121, which are definite, supported in the original specification and patentably distinct over the prior art. Applicants respectfully request reconsideration by the Examiner of rejected and also pending claims 40, 41, 58-60, 69-71, 78-98 and 109-115, as amended hereby, and allowance of all claims, for the following reasons.

### Rejections

The Examiner has rejected claims 40, 58-60, 69-71 and 78-115 under 35 U.S.C. §§112; 132 as being unsupported by the specification as originally filed, i.e. on new matter grounds. The Examiner has rejected claims 58 and 85 further under 35 U.S.C. § 112 for indefiniteness. Specifically, the Examiner objects to “silica based metal oxide”, and suggests amendment of these claims to recite “silica.” The Examiner’s rejections of claims 99-108 are rendered moot by their cancellation. Applicants traverse the remaining rejections based upon the amendments above and the remarks set forth below.

The Examiner has not addressed claim 41 in the text of the Office action. Applicants treat claim 41 for purposes of this response as standing rejected for the same reasons as is claim 40 from which it depends, and hereby amend claim 40 to obtain allowance of both claims 40 and 41.

### Amendments

Claims 40, 58, 79, 84, 85 and 91 are amended hereby in accord with the Examiner’s suggestion, as they now expressly recite a soluble source of silica, an acid catalyst and an ammonium cationic surfactant. Claims containing the objected-to “approximately” limitation have been amended to omit the objected-to term, despite the appearance of the qualifier “about” in connection with certain claimed subject matter in the original Summary of the Invention. Claim 59 is amended hereby to clarify an inadvertently omitted term. Claims 60, 78 and 90 are amended to add the further suggested “alkoxide silica precursor or

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tetrachlorosilane” limitation to the recited soluble source of silica, in accord with the Examiner’s further suggestion. Claims 69, and 98 are amended to add a further limitation to the ammonium cationic surfactant further including “bromide or chloride or their combination”, also in accord with the Examiner’s suggestion. Claims 84 and 85 are amended hereby to omit a “network” limitation to which the Examiner objected in connection only with claim 85. Claims 89, 96 and 97 are hereby cancelled to render moot the Examiner’s rejection of them on new matter grounds. Applicants submit that claims 40, 58, 79, 84, 85 and 91, along with the non-cancelled claims 41, 59-78, 80-83, 86-88, 90, 92, 93, 94, 95 and 98 depending therefrom, are allowable.

Rejected claims 109-115 are amended hereby in response to the Examiner’s rejection. The amended claims recite verbatim an index of refraction limitation supported not only by the graph of Fig. 4, but also by the text of the original specification at column 10, lines 10-11 as being between “1.16” and “that of silica,” which of course it would not exceed since that is the base material for the claimed mesoporous structures. Applicants submit that these claims, as amended, are allowable.

The Examiner has rejected claim 93 because he believes there is no support for “less than ... 10 seconds.” Applicants refer the Examiner to the Summary of the Invention at column 4, lines 10-16, where it is explicitly described that such solvent evaporation be “most preferably less than about 10 seconds.” Applicants request withdrawal of the rejection.

The Examiner has rejected claims 107 because he believes there is no support for “squeegeeing” in their original disclosure. Applicants refer the Examiner to the Summary of the Invention at column 4, lines 22-24; the Abstract at lines 16-18 and allowed claim 14 for ample support of squeegeeing as a method of layer thinning. While rejected claim 107 is cancelled hereby, nevertheless some of the new claims contain the amply supported term “squeegeeing.”

The Examiner also has rejected claims 89 and 97 because they contain a limitation to “polyethylene oxide”, which the Examiner believes is not part of the original disclosure. Applicants refer the Examiner to Example 4 at column 12, where at lines 8-15 it is clear that polyethylene oxide is combined with CTAC as part of the precursor solution. While polyethylene oxide is perhaps in-artfully run together as “[p]oly(ethyleneoxide) (PEO)”, it is

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clear that the reference is to “polyethylene oxide”, as recited in claims 89 and 97. Applicants request withdrawal of the rejections.

The Examiner also has rejected claims 94 and 95, stating the “alcohol which is a by product of hydrolysis” is not supported by the original disclosure. The Examiner has not rejected claims 80, 86 or 87, which contain the very same limitations, on that ground. In fact, the Examiner has stated at page 4 that these claims “appear to be supported by the original disclosure.” Applicants refer the Examiner to column 8, lines 33-36, where it is clearly stated in the context of alcohol-containing precursor sols that “[w]ith the alkoxide silica precursor, an alcohol is a byproduct of hydrolysis.”

#### Support for new claims

Applicants’ invention is not limited to the use of cationic surfactants, as will be argued below, and it is certainly not limited to *ammonium* cationic surfactants. Nevertheless, applicants have amended the rejected claims, as discussed above, to add the ammonium cationic limitation thought by the Examiner to be required, in order to advance allowance of the reissue application.

Nowhere in the original Bruinsma disclosure is the surfactant, catalyst or solvent type within the precursor solution described as being limited to certain chemistries or critical to practicing the invention. Applicants note that the Summary of the Invention does not mention a “cationic” surfactant and any reference to “catalyst” is as a product of the process, not as a part of the solution. Nor does the Summary of the Invention mention “aqueous” solvents. Neither does the Abstract of the Disclosure mention “cationic” surfactant, “aqueous” solvent or any “catalyst.”

New claims 116-121 are formulated as improved method claims that focus not on the precursor solution chemistries but instead on the steps of thinning by spin casting of a layer thereof deposited on a substrate by evaporation of the solvent in less than 5 minutes (claims 116, 118, 120) or by spin casting, drawing, spraying or squeegeeing and evaporating the solvent in less than 5 minutes (claims 117, 119, 121), to form templated mesoporous material.

Claim 116 is clearly allowable because it is consistent with the original disclosure of the invention described in the Summary of the Invention. Claim 116 is limited to an ammonium cationic surfactant. It also is limited to spin casting as the manner of thinning. It omits altogether any unnecessary reference to a catalyst as a part of the solution, as again, the

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only “catalyst” in the Summary of the Invention is a product of the process. It also omits any limitation on the solvent, also consistent with the original Summary of the Invention, since the chemistry is not the focus of the claim. Any critical limitations are included, whether in the preamble or the body of the claim.

Claim 117 is clearly allowable along with claim 116, which it resembles. Claim 117 omits the substrate and includes drawing, spraying or squeegeeing in addition to spin casting, consistent with the original Summary of the Invention. Again, the chemistry is not the focus of the claim; the novelty of the improvement relies on the combination of steps including spin casting, drawing, spraying or squeegeeing the silica precursor solution and evaporating the solvent therefrom in less than 5 minutes. Again, any critical limitations are included, whether in the preamble or the body of the claim.

Claim 118 is clearly allowable also. Claim 118 is similar to claim 116, but it omits surfactant type, which is irrelevant to the part of the process that represents the claimed improvement. Again, applicants note that the terms “cationic” and “ammonium cationic” are not even mentioned in the original Summary of the Invention. Moreover, there is nothing in the cited prior art or the specification to suggest that surfactant type matters to the claimed improvement. Thus, claim 118 is limited to what the original Summary of the Invention describes as being critical, there being nothing whatsoever in applicants’ disclosure suggesting the type of surfactant used is critical.

A precise definition of materials is not needed in a claim when the essence of the invention does not reside in the use of those materials in the process. See *Ex Parte McAllister, et al.*, 92 USPQ 373 (POBA 1950) and *Ex parte Calingaert, et al.*, 52 USPQ 263 (POBA 1941). Any assertion by the United States Patent and Trademark Office that the enabling disclosure is not commensurate in scope with the protection sought must be supported by evidence or reasoning substantiating the doubts suppressed. See *In re Dinh-Nguyen, et al.*, 181 USPQ 46, 492 F2d 856 (CCPA 1974); *In re Bowen*, 181 USPQ 48, 492 F2d 859 (CCPA 1974); and *In re Armbruster*, 185 USPQ 152, 512 F2d 676 (CCPA 1975). There is no such evidence of record, and there has been no such substantive showing. Accordingly, claim 118 is definite, imports no new matter, is clearly supported by the original disclosure and is patentably distinct over the prior art.

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Claim 119 is clearly allowable along with claim 116, which it resembles. Claim 119 omits unnecessary reference to a substrate and further includes drawing, spraying or squeegeeing along with spin casting as manners of thinning. As stated above, the chemistry is not the focus of the claim; the novelty of the improvement relies on the combination of steps including spin casting, drawing, spraying or squeegeeing the silica precursor solution and evaporating the solvent therefrom in less than 5 minutes. Again, any critical limitations are included, whether in the preamble or the body of the claim.

Claim 120 is clearly allowable along with claim 118 which it resembles. Claim 120 omits unnecessary reference to surfactant. This is not broader than the original disclosure. While templated mesoporous material might inherently include a surfactant, the point of the claim is that the surfactant is irrelevant to the claimed improvement, the essence of which lies in the recited steps including thinning by spin casting and forming a templated mesoporous material on a substrate by evaporation of a solvent in less than 5 minutes, steps not taught by the cited prior art.

Finally, claim 121 is clearly allowable. It is similar to claim 120, but omits the unnecessary reference to a substrate and further includes drawing, spraying or squeegeeing along with spin casting as manners of thinning. As stated above, the chemistry is not the focus of the claim; the novelty of the improvement relies on the combination of steps including spin casting, drawing, spraying or squeegeeing the silica precursor solution and evaporating the solvent therefrom in less than 5 minutes. Again, any critical limitations are included, whether in the preamble or the body of the claim. And, to reiterate, a precise definition of materials is not needed when the essence of the invented improvement does not reside in the use of those materials in the process. (See *McAllister, et al.*; *Calingaert, et al.*)

Thus, new claims 116-121 add no new matter, avoid objected-to claims terminology and definitely and distinctly claim applicants' invention. The new claims find support in the Abstract (preparing and forming silica precursor solution into preform and rapidly evaporating a solvent therefrom; spin casting, liquid drawing, spraying or squeegeeing to form a layer on a surface, e.g. a substrate). They also find support in the Summary of the Invention at column 3, lines 39-54 (silica precursor solution with solvent; avoiding gelation and precipitation; rapid drying or evaporation of solvent by layer thinning including spin casting, drawing or spraying) and 57-62 (evaporative process; composition of silica precursor sol including silica and surfactant); column 3, line 66-column 4, line 5 (alkoxide silica

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precursor; avoiding non-porous and lamellar structures); column 4, lines 10-25 (rate of solvent evaporation, which is critical to formation, less than 5 minutes; forming layer of prepared precursor solution on a surface, e.g. a substrate, and then removal by thinning including squeegeeing) and 35-38 (thinning with a spin-coater, i.e. via spin-casting) and 51-56 (spray drying); column 5, lines 17-21 (drawing) and 48-50 (solvent evaporation). Claims 116 and 117 find support for the ammonium cationic surfactant at column 7, lines 40-43 and elsewhere. Applicants submit that these new claims are clearly allowable over the prior art, none of which teaches the recited combinations of templated mesoporous material-making steps including preparing, dispensing, thinning by spin casting, drawing, spraying or squeegeeing and forming by evaporation "in less than 5 minutes."

### Conclusion

Accordingly, a favorable action allowing applicants' amended claims is respectfully requested. Applicants' undersigned patent counsel requests a courtesy phone call from the Examiner upon reconsideration and prior to issuance of another Office action or Notice of Allowance.



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PATENT TRADEMARK OFFICE

Respectfully submitted,

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I hereby certify that this correspondence is being deposited on **August 21, 2001** with the United States Postal Service as First Class mail in an envelope addressed to Assistant Commissioner of Patents, Washington, DC 20231.

Dated: **August 21, 2001**

Judy Wigmore

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**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

**In the Claims**

Claims 28-39 are cancelled.

40. (Amended) A method of making a mesoporous film on a substrate, the method comprising the steps of:

- (a) combining a silica precursor with an aqueous solvent, an acid catalyst and [a] an ammonium cationic surfactant into a precursor solution;
- (b) dispensing said precursor solution onto the substrate;
- (c) forming a film by evaporation of the solvent in less than [approximately] 5 minutes; and
- (d) heating the film on the substrate to a temperature sufficient to decompose the surfactant, thereby producing a mesoporous film on the substrate.

58. (Thrice amended) A process to form mesostructured films, comprising:

- (a) preparing a precursor sol containing a soluble source of [a silica-based metal oxide] silica, an aqueous solvent, an ammonium cationic surfactant and an acid catalyst; and
- (b) depositing the precursor sol on a substrate wherein evaporation of solvent and water in less than 5 minutes causes the formation of said mesostructured films on the substrate surface.

59. (Twice amended) The process of claim 58 wherein the aqueous solvent and the catalyst are provided in amounts that maintain a hydrolyzed precursor sol while avoiding gelation or precipitation.

60. (Twice amended) The process of claim 58 wherein the soluble source of silica is [an] a silica precursor alkoxide or tetrachlorosilane and wherein the surfactant and the soluble source of silica are in a mole ratio that is above a lower mole ratio that produces a non-porous silica phase and below an upper mole ratio that produces a lamellar phase.

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69. (Twice amended) The process of claim 58, wherein the ammonium cationic surfactant further includes [an ammonium cationic surfactant] bromide or chloride or their combination.

70. (Twice amended) The process of claim 58, further comprising the step of calcining said film at [approximately] 450°C.

78. (Amended) The process of claim 58, wherein said soluble source of silica is an alkoxide silica precursor or tetrachlorosilane.

79. (Amended) A process to form a mesoporous structure, comprising:

(a) preparing a precursor sol containing a soluble source of [a silicon or silicon-aluminum oxide] silica, an alcohol and water solvent, an ammonium cationic surfactant, and an acid catalyst, wherein said solvent is provided in an amount resulting in complete hydrolysis and said acid catalyst is in an amount to maintain a hydrolyzed precursor and to avoid gelation or precipitation in said precursor sol;

(b) forming the precursor sol into a preform;

(c) evaporating said solvent from the preform at a rate that forms a mesostructured material; and

(d) calcining the mesostructured material to form a mesoporous structure.

83. (Amended) The process of claim 79, wherein said precursor sol contains dilutant alcohol, and wherein the [mesostructure] mesoporous structure is a film.



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84. (Amended) A process to form a mesoporous structure, comprising:

(a) preparing a precursor sol containing a soluble source of [a silicon or silicon-aluminum oxide] silica, an alcohol and water solvent, an ammonium cationic surfactant, and an acid catalyst, wherein said solvent is provided in an amount resulting in complete hydrolysis and said acid is in amount to maintain a hydrolyzed precursor and to avoid gelation or precipitation in said precursor sol;

(b) forming the precursor sol into a preform;

(c) evaporating said solvent from the preform at a rate that forms a mesostructured material, wherein said mesostructured material contains surfactant [and a silicate or aluminosilicate network]; and

(d) calcining the mesostructured material to form a mesoporous structure.

85. (Amended) A process to form a mesostructure, comprising:

(a) preparing a precursor sol containing a soluble source of [a silica-based metal oxide] silica, water and alcohol solvent, an ammonium cationic surfactant and a catalyst; and

(b) evaporating said solvent in less than [approximately] 5 minutes to cause the formation of a mesostructure, wherein said mesostructure contains surfactant [and a silicate network].

Claim 89 is cancelled.

90. (Amended) The process of claim 79, wherein said soluble source of [a silicon or silicon-aluminum oxide] silica includes [an] a silica alkoxide precursor or tetrachlorosilane.

91. (Amended) A process to form a mesostructure, comprising:

(a) preparing a precursor sol containing a soluble source of silica, a water and alcohol solvent, an ammonium cationic surfactant and [a] an acid catalyst, and

(b) evaporating said solvent in less than 5 minutes to cause the formation of a mesostructure.

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92. (Amended) The process of claim 91, wherein said solvent is evaporated in less than [approximately] 1 minute.

93. (Amended) The process of claim 91, wherein said solvent is evaporated in less than [approximately] 10 seconds.

94. (Amended) The process of claim 91, wherein the said precursor sol contains both dilutant alcohol and alcohol which is a byproduct of hydrolysis, and wherein said mesostructure is a film.

Claim 96 is cancelled.

Claim 97 is cancelled.

98. (Amended) The process of claim 91, wherein the ammonium cationic surfactant [is cationic] further includes bromide or chloride or their combination.

Claims 99-108 are cancelled.

109. (Amended) The process of claim 40, wherein the film exhibits an index of refraction [of] between [approximately 1.14] 1.16 and [approximately 1.44] that of silica.

110. (Amended) The process of claim 58, wherein the films exhibit an index of refraction [of] between [approximately 1.14] 1.16 and [approximately 1.44] that of silica.

111. (Amended) The process of claim 79, wherein the mesoporous structure is a film and wherein the film exhibits an index of refraction of between [approximately 1.14] 1.16 and [approximately 1.44] that of silica.

112. (Amended) The process of claim 85, wherein the [mesoporous structure] mesostructure is a film, and wherein the film exhibits an index of refraction of between [approximately 1.14] 1.16 and [approximately 1.44] that of silica.

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113. (Amended) The process of claim 86, wherein [the mesostructure is a film, and wherein] the film exhibits an index of refraction of between [approximately 1.14] 1.16 and [approximately 1.44] that of silica.

114. (Amended) The process of claim 92, wherein the mesostructure is a film, and wherein the film exhibits an index of refraction of between [approximately 1.14] 1.16 and [approximately 1.44] that of silica.

115. (Amended) The process of claim 99, wherein the films exhibit an index of refraction of between [approximately 1.14] 1.16 and [approximately 1.44] that of silica.

Claims 116-121 are new.